

# Novice & Expert Brains: The differences and how to teach novices to think like experts

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CERADWEN TOKHEIM (she/her) - SOMALT

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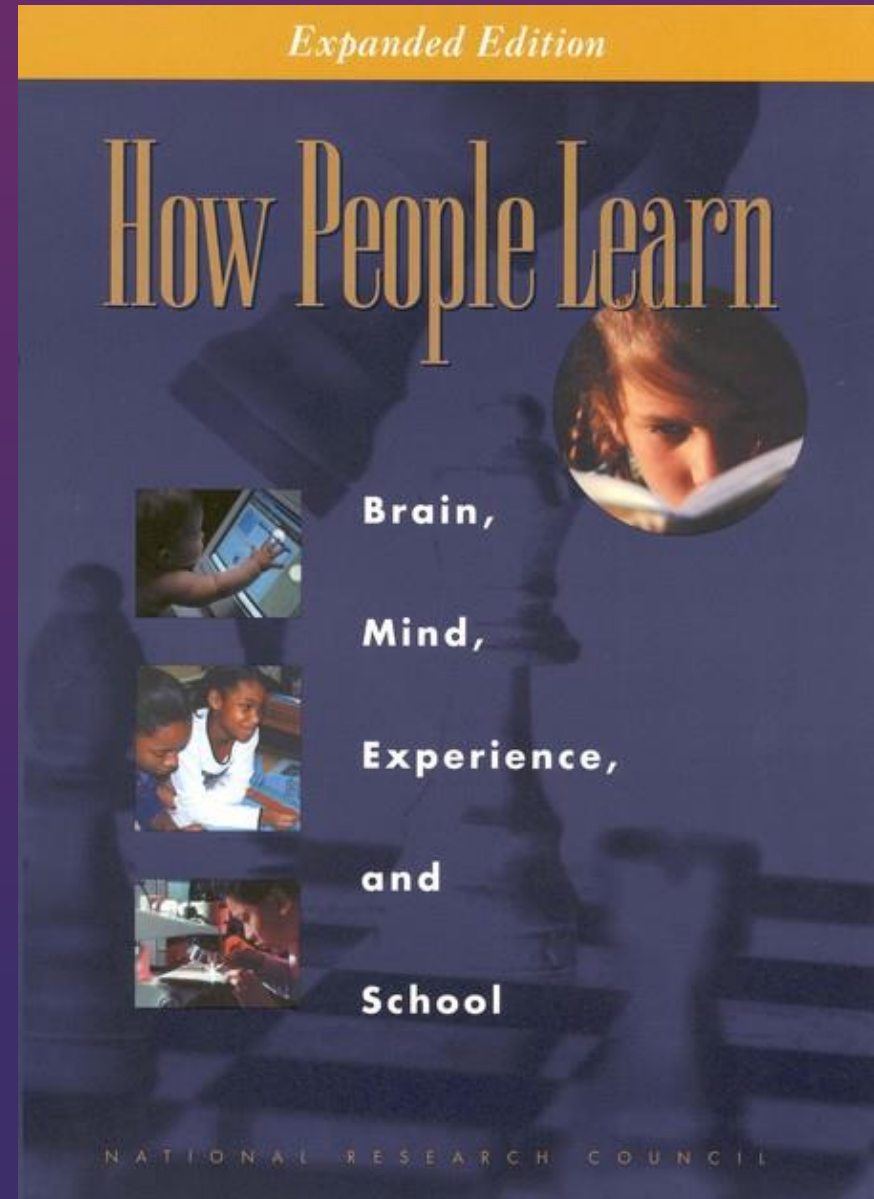
# Acknowledgements

I would like to acknowledge that I am speaking to you from traditional land of the **Central Coast Salish Tribes**, past and present, and I honor with gratitude the land itself, the **Lummi and Upper Skagit Nations**, as well as the **Swinomish, Songees, Saamish, and Mitchel Bay Tribes**.

# Acknowledgements

This presentation closely follows the pedagogical theories in *How People Learn*, and how it is further interpreted by the teaching guide from The Center for Teaching at Vanderbilt University

John D. Bransford, Ann L. Brown and Rodney R. Cocking, editors. (2000) *How People Learn: Brain, Mind, Experience and School*. National Academies Press; expanded ed.



# Ahhh to be a Novice again

- What does it feel like to start learning something new?
- [Cue video](#)



# Can you parse it?

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NEQUE·PORRO·QUISQUAM·EST·QUI·DOLOREM·IPSUM·QUIA·DOLOR·SIT·AMET·CONSECTETUR·ADIPISCI·VELIT

Or in English:

NOBODYLIKESPAINFORITSOWNSAKEORLOOKSFORITANDWANTSTOHAVEITJUSTBECAUSEITISPAIN

Nobody likes pain for its own sake, or looks for it and wants to have it, just because it is pain...

# Facts + Framework + Organization = Competence

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To develop competence in an area of inquiry, a student must:

- A. Have a deep foundation of factual knowledge,
- B. Understand facts and ideas in the context of a conceptual framework,
- C. Organize knowledge in ways that facilitate retrieval and application.

NOBODY LIKES PAIN FOR ITS OWN SAKE OR LOOKS FOR IT AND WANTS TO HAVE IT JUST BECAUSE IT IS PAIN

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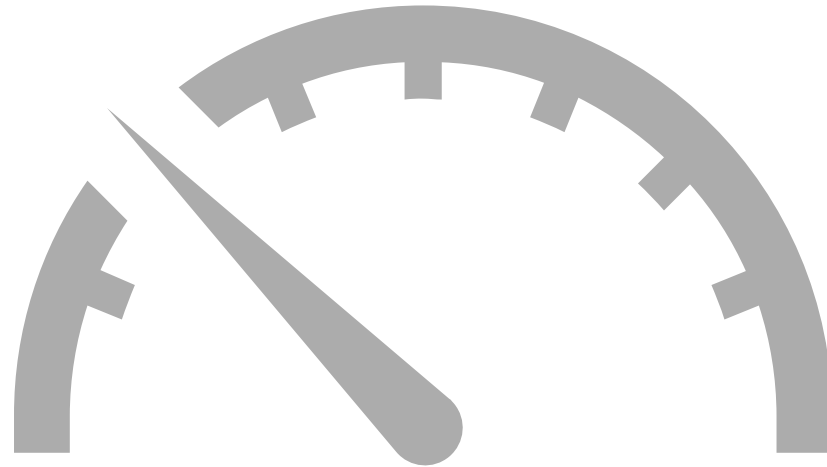
# Expertise

- What are the characteristics of Expertise?

# Expertise is on a continuum

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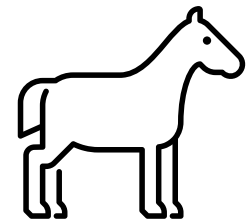
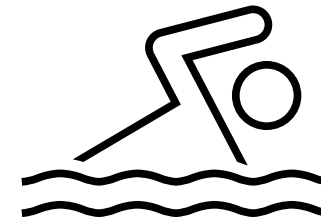
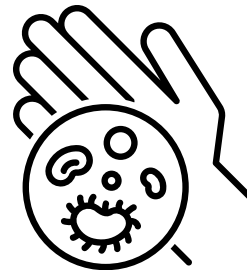
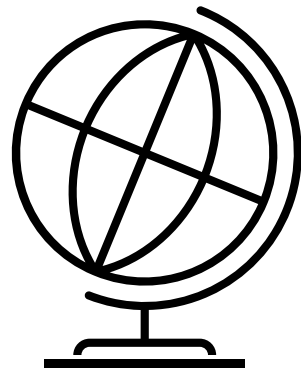
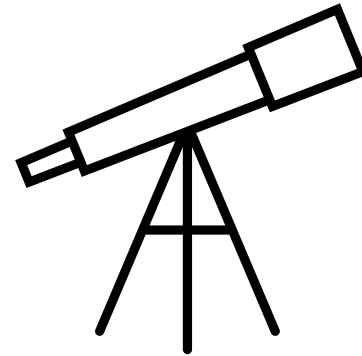
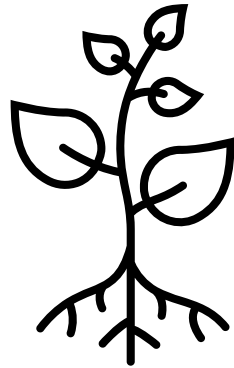
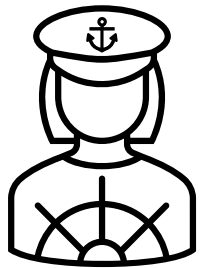
that runs from novice to expert, and one is more or less fluent in one's expertise.





# Expertise is field-dependent.

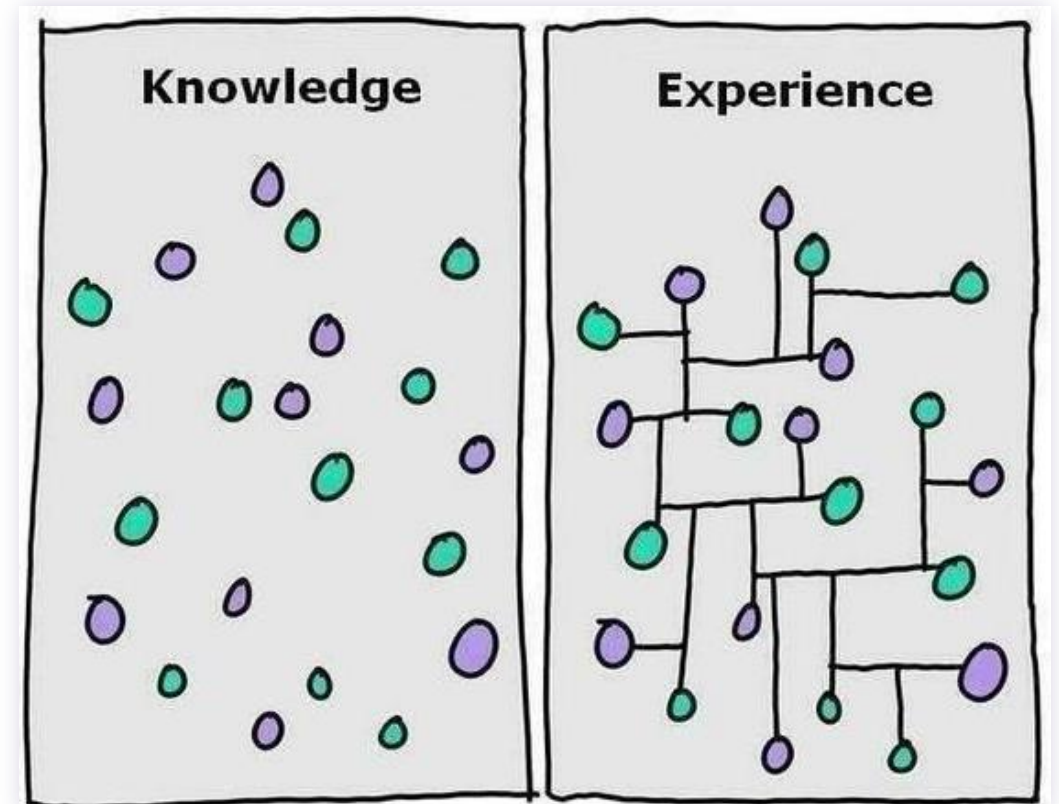
Expertise in one field doesn't translate directly to expertise in another field.



# Characteristics of expertise:

Expert learners have **well-organized knowledge**, not just problem-solving strategies.

Expert knowledge is **organized to support understanding**, not just recall. And the organization is grounded in a field's foundational concepts.



# Characteristics of expertise:

Expert knowledge is **conditionalized**, and the conditional relationships form patterns that experts recognize and rely upon.

An expert's fluency allows the **easy retrieval of relevant knowledge**. The patterns mentioned in the previous point are second nature to the expert, while the novice struggles to recognize them. This **fluency with fundamental patterns** frees the mental energy to focus on new knowledge to add to the pattern.



# Characteristics of expertise:

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There is a difference between **adaptive experts**, whose metacognitive skills allow the transfer of knowledge from one setting to another, and **routine experts**, whose expertise allows them to function well in standard settings but doesn't serve them well when conditions are different."

# Challenges in Developing Expertise

- How can an Expert Support a Novice to become an expert?

# Challenges in developing expertise

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The development and retention of new knowledge depends in large part on the relationship between what one is learning and what one already knows.

Because novices in a field typically don't know much of the content in that field, **they have little to which they can relate the things they're attempting to learn.** So they retain less.

# Challenges in developing expertise

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Since novices typically don't grasp the fundamental principles in a field, they don't see the patterns grounded in those principles.

They tend therefore to adopt an **idiosyncratic organizational scheme** for what they are learning.

This organizational scheme might function well enough in a particular context (e.g., in the particular unit they're covering in a part of a class) but it doesn't serve them well in other areas of the field. It doesn't transfer well.

# Challenges in developing expertise

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## The Curse of Knowledge

The **expert's fluency can conceal the very principles and strategies that the novice must learn** in order to become more expert. These principles and strategies are often invisible even to the expert precisely because they are second nature.

And they're invisible to the novice observing the expert because they're implicit in the expert's work.



# End Goal



# What you Present

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# What students See

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# Break out

Pick a topic in your small group and identify the:

1. Foundational Factual Knowledge
2. Context/ Conceptual Framework
3. Organization based on Field's Foundational Concepts

# Implications for Teaching

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## Make thinking visible

- **Student thinking:** Have students engage in activities that make visible the processes of their thinking, rather than merely the conclusions of their thinking.
- **Expert thinking:** Model expert thinking, being careful to make explicit the strategies and techniques that are implicit in expert thinking.

# Implications for Teaching

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## Be aware of knowledge level of students

- The knowledge (and misunderstandings) they bring with them into the class will shape what they learn in the class.

# Implications for Teaching

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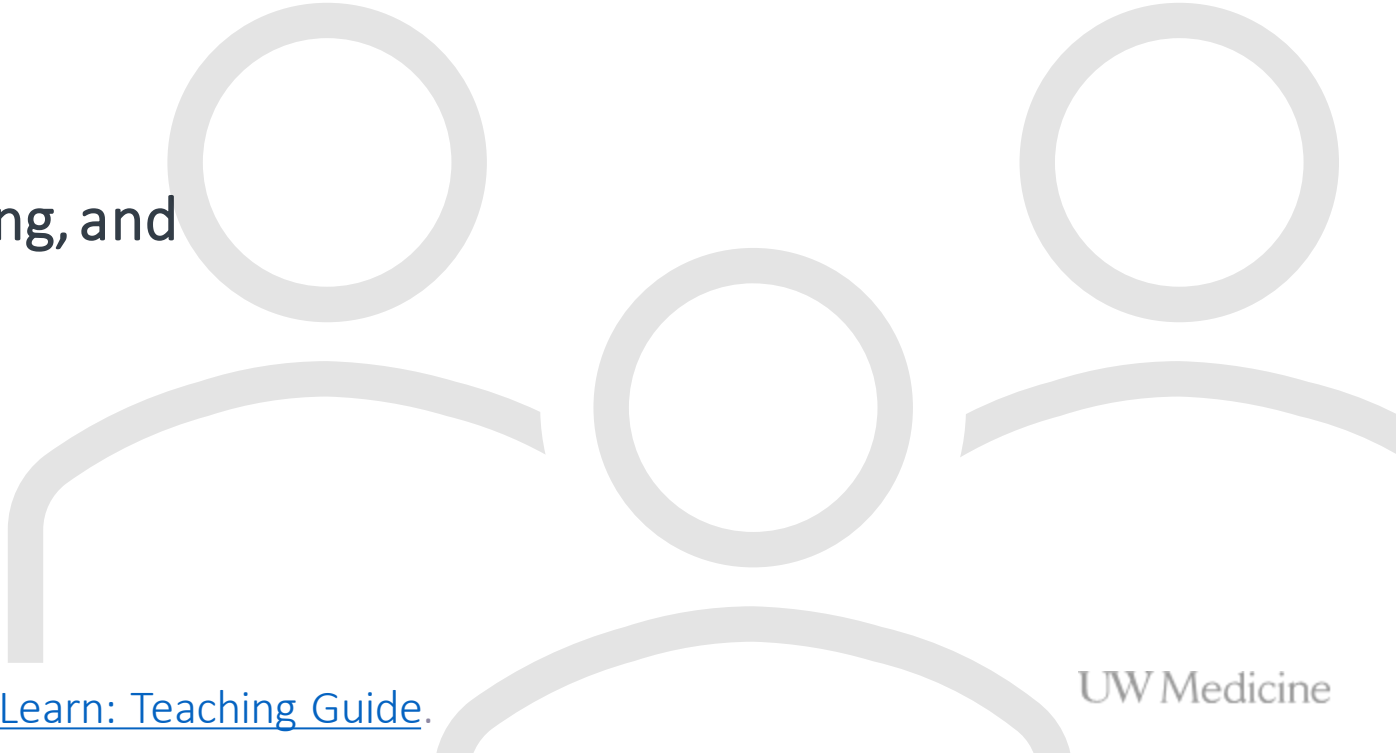
## Use contrasting cases as examples.

- Contrasting cases—two examples whose differences highlight a particular point or set of points—can illustrate the particular points you are highlighting as an instructor. Note that experts are more likely than novices to see the relevant contrast between two complex cases that are similar in many respects. So it's best to start with relatively simple cases and then move to complexity as understanding deepens.

# Creating Effective Learning Communities



According to the cognitive research covered in *How People Learn*, environments that best promote learning have four interdependent aspects—

1. they focus on learners,
  2. well-organized knowledge,
  3. ongoing assessment for understanding, and
  4. community support and challenge.
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# Learner Centered



Learner-centered environments pay careful attention to the knowledge, skills, attitudes, and beliefs that learners bring to the educational setting. Teachers must realize that new knowledge is built on existing knowledge—students are not blank slates.

Therefore, **teachers need to uncover the incomplete understandings, false beliefs and naïve renditions of concepts that students have when they begin a course.** If these are ignored, students may develop understandings very different from what the teacher intends them to gain.

# Knowledge Centered



Knowledge-centered environments take seriously the need to help students learn the well-organized bodies of knowledge that support understanding and adaptive expertise.

Teachers are wise to point their students directly toward clear learning goals—to tell students exactly what knowledge they will be gaining, and how they can use that knowledge. In addition, a strong foundational structure of basic concepts will give students a solid base on which to build further learning.

# Assessment Centered

A large, light gray outline of a microscope is positioned on the right side of the slide, partially overlapping the text. The microscope is oriented vertically, with the eyepiece at the top and the base at the bottom.

Assessment-centered environments provide frequent formal and informal opportunities for feedback focused on understanding, not memorization, to encourage and reward meaningful learning. Feedback is fundamental to learning, but feedback opportunities are often too scarce in classrooms. Students may receive grades on tests and essays, but these are summative assessments that occur at the end of projects.

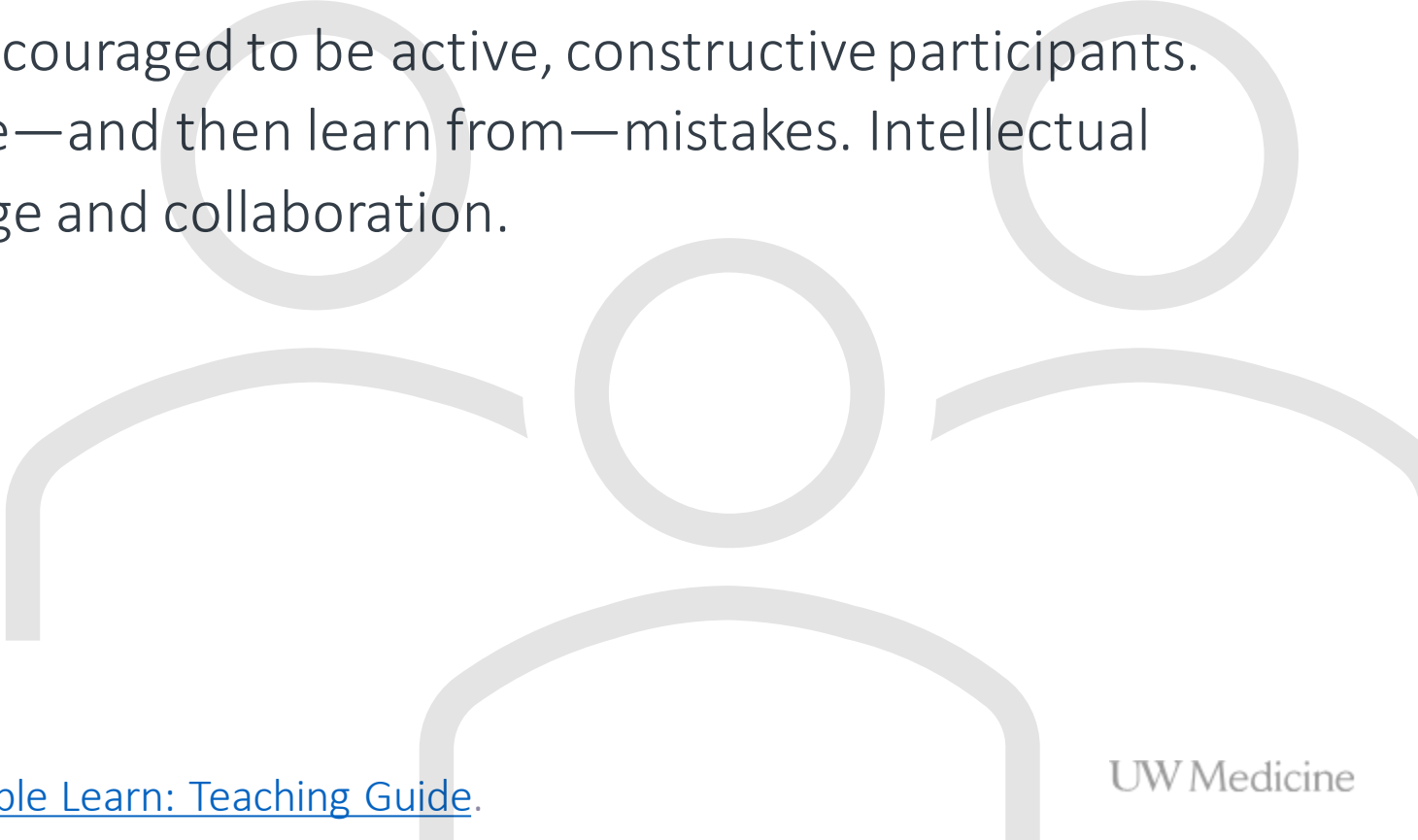
**What are needed are formative assessments that provide students with opportunities to revise and improve the quality of their thinking and understanding.** The goal is for students to gain meta-cognitive abilities to self-assess, reflect and rethink for better understanding.

# Community Centered



Community-centered environments foster norms for **people learning from one another, and continually attempting to improve.**

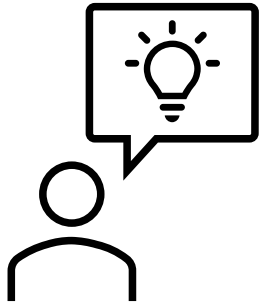
In such a community, students are encouraged to be active, constructive participants. Further, they are encouraged to make—and then learn from—mistakes. Intellectual camaraderie fosters support, challenge and collaboration.



# Effective Learning Communities

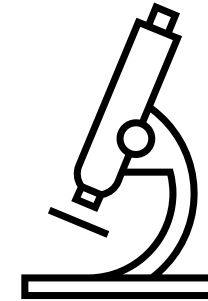
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The most effective learning environments contain all four of these interdependent foci.



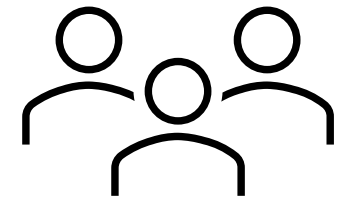
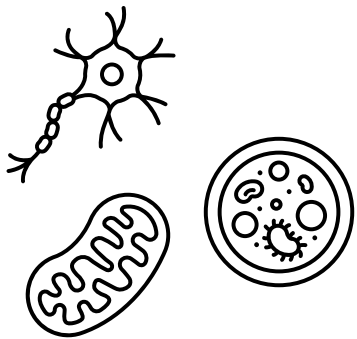
- Learner Centered

- Knowledge Centered



- Assessment Centered

- Community Centered



# References

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- Thank you John Bransford, Ann Brown, & Rodney Cocking for your excellent editing, writing, and research.
- Center for Teaching, Vanderbilt University. [How People Learn: Teaching Guide](#). Retrieved May 25<sup>th</sup>, 2021.
- Wikipedia page on [Scriptio Continua](#). Retrieved May 25<sup>th</sup>, 2021.